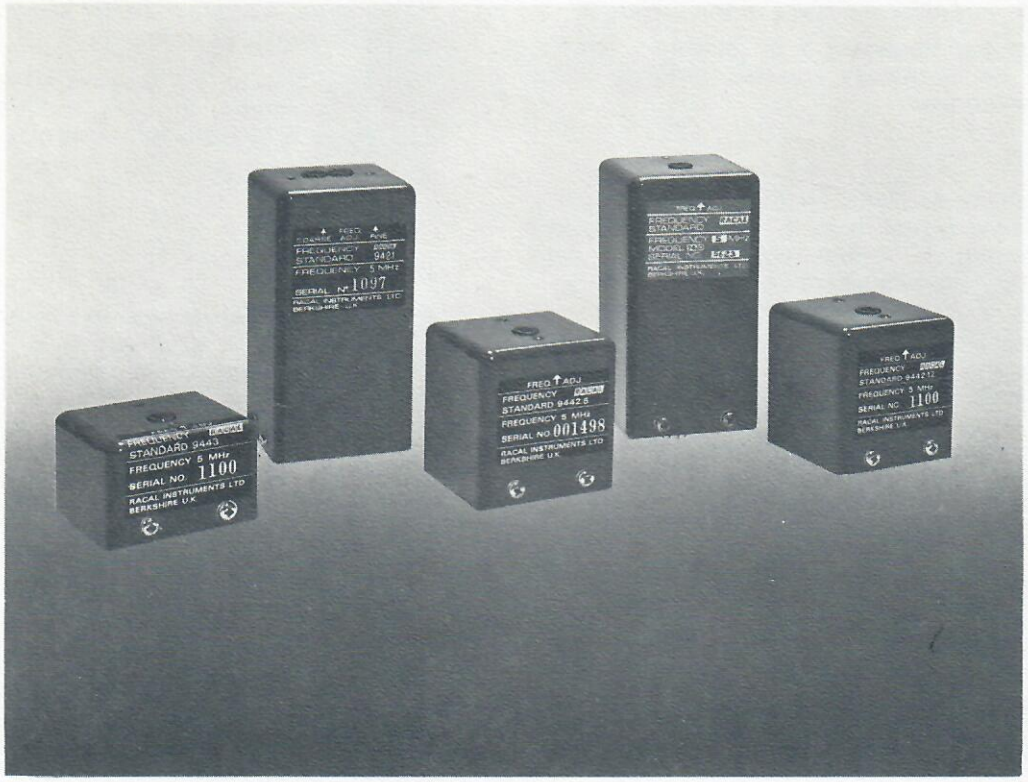
# Product Information




# Crystal Oscillators

*Racal crystal controlled frequency standards combine low power consumption, good temperature stabilization and excellent ageing performance, and are ideal for use in communications equipment and precision instruments. They are built to stringent military specifications and use only the highest quality glass or coldweld sealed crystals from carefully evaluated suppliers. Great care is taken in production including checking and recording of the temperature and ageing performance of every individual oscillator. Small size, robust construction and fast warm-up characteristics make these oscillators particularly suitable for transportable equipment where high accuracy is required as soon as possible after switch on.*

## Racal Instruments Limited

# technical specifications

## 9420

A very high stability oscillator with a 20 minute warm-up. For optimum ageing a 5MHz 3rd overtone crystal is used in an oven with proportional temperature control. A voltage regulator ensures high immunity to supply variations while a buffer amplifier minimises the effect of load changes.

Mechanical setting of frequency is by multi-turn control. Frequency can be electrically adjusted remotely using an external potentiometer.

## 9421

A very high stability oscillator for 5V supplies. It uses a 5MHz, 3rd overtone crystal in an oven with proportional temperature control. A voltage regulator gives high immunity to supply variations and a buffer amplifier minimises the effect of load changes.

Multi-turn coarse and fine controls permit precise setting of frequency. The frequency can also be adjusted remotely by a potentiometer.

## 9442

This oscillator has a warm-up time of only a few minutes. It is small and combines high accuracy with long term stability and low power consumption. The 5MHz crystal is in an oven with proportional temperature control. A buffer amplifier isolates the oscillator from load variations.

The 9442/5 is for 5V supplies while the 9442/12 is a 12V model. In both oscillators frequency adjustment is by multi-turn control.

## 9443

Electrically similar to type 9442, the 9443 is only $1\frac{1}{4}$ in. high. The specification is identical in all respects except temperature performance and power consumption.

| | 9420 | 9421 | 9442 | 9443 |
|---|---|---|---|---|
| **Output Frequency** | 5MHz | | | |
| **Output Level** | 1V into 50Ω | 1V into 50Ω | 1V into 1kΩ | |
| **Operating Temperature** | −10°C to +60°C | | | |
| **Daily Ageing Rate** (after 3 months) | $\pm 5 \times 10^{-10}$ | | $\pm 3 \times 10^{-9}$ | |
| **Warm-up Time** (for $1 \times 10^{-7}$ accuracy) | 20 minutes | | 6 minutes | |
| **Stability with Temperature Change** (per °C) | $\pm 6 \times 10^{-10}$ | | $\pm 3 \times 10^{-9}$ | $\pm 4 \times 10^{-9}$ |
| **Stability with 10% Supply Voltage Change** | $\pm 5 \times 10^{-9}$ | $\pm 3 \times 10^{-9}$ | $\pm 4 \times 10^{-8}$ | |
| **Stability with 10% Load Change** | $\pm 5 \times 10^{-9}$ | $\pm 3 \times 10^{-9}$ | $\pm 5 \times 10^{-9}$ | |
| **Trim Range** (parts in $10^7$) | −8 to +2 | −7 to +3 | −60 to +30 | |
| **Supply Voltage** | 12V | 5V | 5V or 12V | 5V |
| **Typical Supply Current** (After Warm-up) | 120mA | 250mA | 150mA (5V)<br>60mA (12V) | 170mA |
| **Dimensions** | 51 x 51 x 96 mm<br>2 x 2 x 3.75 in | | 51 x 51 x 51 mm<br>2 x 2 x 2 in | 51 x 51 x 32 mm<br>2 x 2 x 1.25 in |
| **Base** | B7G | | | |

The RACAL policy is one of continuous development, and consequently may vary in detail from the description and specification in this publication.

RACAL

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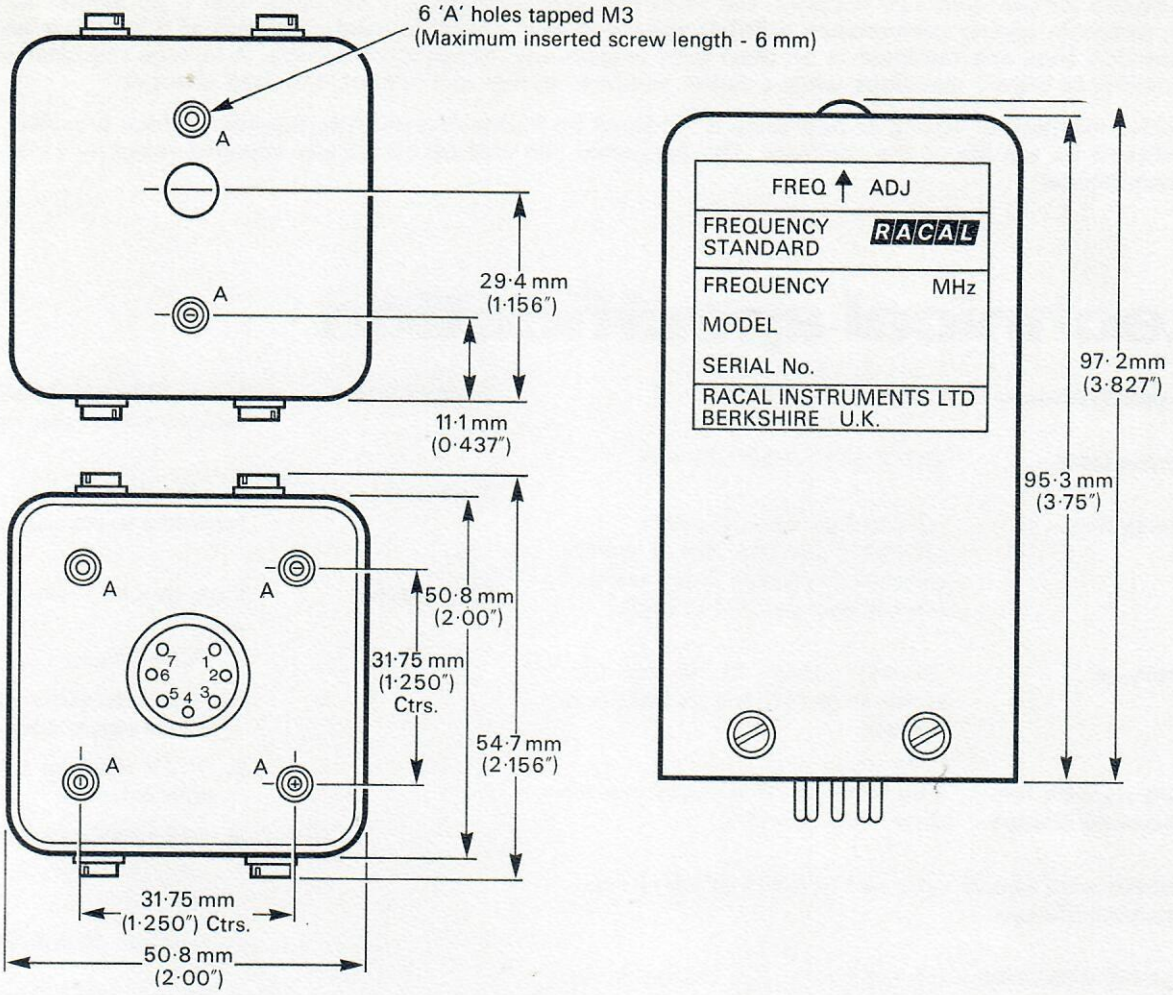
# Product Information




# 9420 Crystal Oscillator

*Racal crystal controlled frequency standards combine low power consumption, good temperature stabilization and excellent ageing performance, and are ideal for use in communications equipment and precision instruments. They are built to stringent military specifications and use only the highest quality glass or coldweld sealed crystals from carefully evaluated suppliers. Great care is taken in production including checking and recording of the temperature and ageing performance of every individual oscillator. Small size, robust construction and fast warm-up characteristics make these oscillators particularly suitable for transportable equipment where high accuracy is required as soon as possible after switch on.*

**Racal-Dana Instruments Limited**

Designed for use with 12V supplies, the 9420 is a very high stability oscillator with a 20 minute warm-up time. For optimum ageing performance a 5MHz third overtone crystal is used operating at a very low and stabilized excitation level and mounted in an oven with proportional temperature control. A voltage regulator ensures high immunity to supply variations while a buffer amplifier minimises the effects of load changes.

Precise mechanical setting of frequency is achieved by means of a multi-turn control which provides a trim range sufficient for the life of the oscillator. The frequency can also be electrically adjusted remotely using an external potentiometer.

# technical specification

**Output Frequency** 5MHz.

**Output Level** 330mV r.m.s. ±50mV into 50Ω.

**Ageing Rate** $\pm 2 \times 10^{-9}$ per day at shipment. $\pm 5 \times 10^{-10}$ per day after 3 months continuous operation (rates averaged over minimum period of 10 days).

**Warm-up** $\pm 1 \times 10^{-7}$ within 20 minutes from switch-on (at 25°C and nominal supply voltage).

**Stability with Temperature Change** $\pm 6 \times 10^{-10}$ per °C averaged over the range –10°C to +60°C.

**Stability with Supply Voltage Change** $\pm 5 \times 10^{-9}$ for ±10% voltage change.

**Stability with Load Change** $\pm 5 \times 10^{-9}$ for ±10% change of 50Ω load.

**Trim Range, Coarse** Approximately –8 to +2 parts in $10^7$ by adjustment of a thirteen-turn variable capacitor accessible via an aperture in top face of oscillator can.

**Trim Range, Electrical** Approximately 1 part in $10^7$ for a voltage variation from 2.8 to 5.6 volts.

**Supply Voltage** +12 volts ±10%.

**Supply Current** Initially 350mA for 20 minutes. Typically 120mA after warm-up.

**Dimensions** 51 x 51 x 96mm (2 x 2 x 3.75in). (excluding length of pins in base).

**Connections** Made via a B7G base.

*Pin*

1. 5MHz output.
2. +5.6 volts internally stabilized voltage for varicap diode control.
3. +7.5V stabilized voltage (monitor point only).
4. +12 volts supply input.
5. +2.8 volts internally stabilized voltage.
6. Electrical control to the varicap diode. (Connected to pin 5 when external electrical control not used.)
7. 0 volts (the can is also connected to Pin 7).

**Mounting** On bottom face by 4 captive nuts spaced symmetrically 31.75mm (1.25 in) between centres. Alternative fixing by 2 captive nuts on top face. The retaining screws are metric M3 length 6mm.

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RACAL

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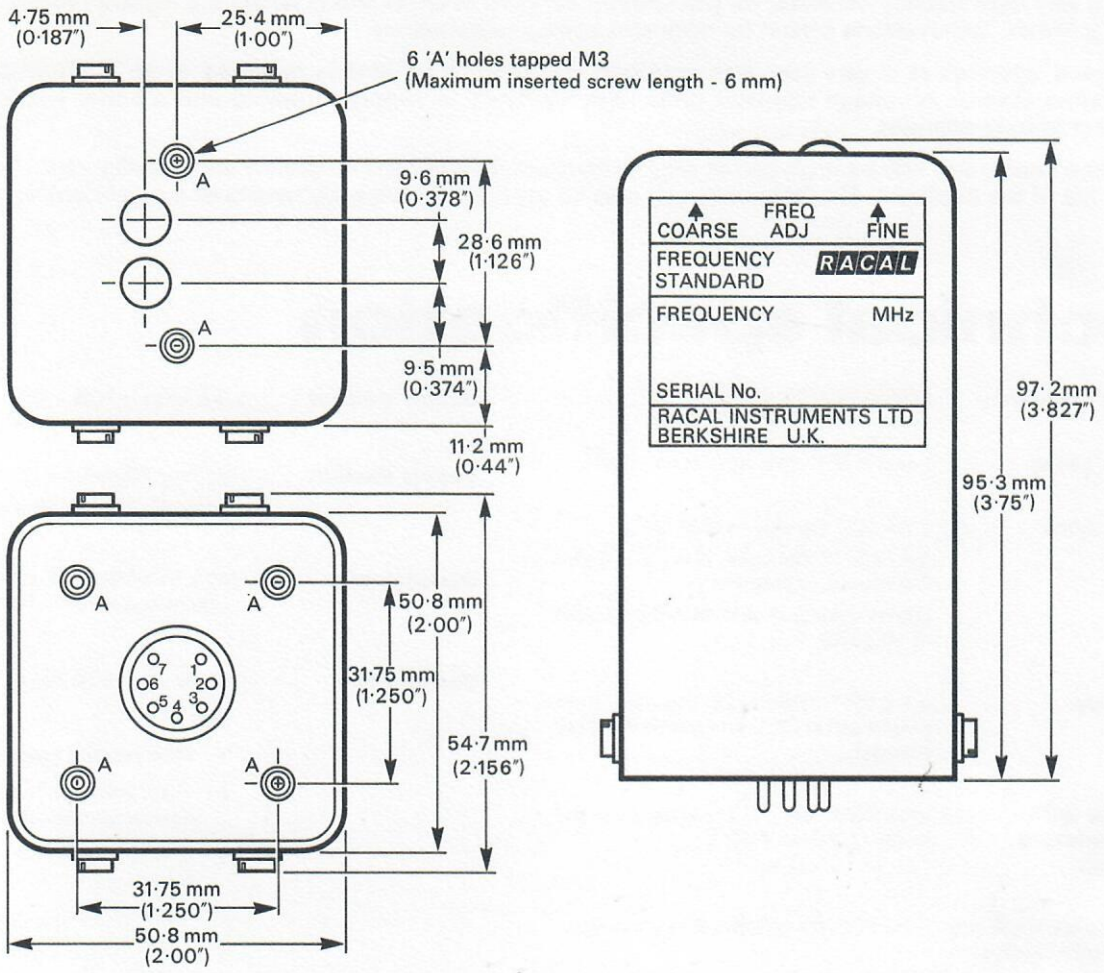
# Product Information




# 9421 Crystal Oscillator

*Racal crystal controlled frequency standards combine low power consumption, good temperature stabilization and excellent ageing performance, and are ideal for use in communications equipment and precision instruments. They are built to stringent military specifications and use only the highest quality glass or coldweld sealed crystals from carefully evaluated suppliers. Great care is taken in production including checking and recording of the temperature and ageing performance of every individual oscillator. Small size, robust construction and fast warm-up characteristics make these oscillators particularly suitable for transportable equipment where high accuracy is required as soon as possible after switch on.*

**Racal-Dana Instruments Limited**

This is a very high stability oscillator for use with 5V supplies in applications where the highest precision is essential. It uses a 5MHz, 3rd overtone crystal for optimum ageing performance.

The crystal operates at a very low and stabilized excitation level and is mounted in an oven with proportional temperature control. A voltage regulator gives high immunity to supply variations and a buffer amplifier minimises the effect of load changes.

Multi-turn coarse and fine controls permit precise mechanical setting of frequency and provide a trim range sufficient for the life of the oscillator. The frequency can also be adjusted remotely by means of a potentiometer.

# technical specification

**Output Frequency** 5MHz.

**Output Level** 1 volt ±20% peak-to-peak in 50Ω

**Ageing Rate** $\pm 2 \times 10^{-9}$ per day at shipment.
$\pm 5 \times 10^{-10}$ per day after 3 months continuous operation.
(Rates averaged over minimum period of 10 days).

**Warm-Up** $\pm 1 \times 10^{-7}$ within 20 minutes from switch on (at 25°C and nominal supply voltage).

**Stability with Temperature Change** $\pm 6 \times 10^{-10}$ per °C averaged over the range –10°C to +60°C.

**Stability with Supply Voltage Change** $\pm 3 \times 10^{-9}$ for ±10% voltage change.

**Stability with Load Change** $\pm 3 \times 10^{-9}$ for ±10% change of 50Ω load.

**Trim Range, Coarse** Approximately –7 to +3 parts in $10^7$ by adjustment of a thirteen turn variable capacitor accessible via an aperture in top face of oscillator can.

**Trim Range, Fine** Approximately 1 part in $10^7$, by adjustment of a thirteen turn variable capacitor accessible via an aperture in top face of oscillator can.

**Trim Range, Electrical** Approximately 1 part in $10^7$ for a voltage variation from 1.6 to 3.2 volts.

**Supply Voltage** +5 volts ±10%.

**Supply Current** Initially 700mA for 20 minutes.
Typically 250mA after warm-up.

**Dimensions** 51 x 51 x 96mm (2 x 2 x 3.75in).
(Excluding length of pins in base).

**Connections** Made via a B7G base.

*Pin*

1 5MHz output (with respect to Pin 7).

2 +3.2 volts, internally stabilized voltage for varicap diode control.

3 0 volt connection for the external electrical control.

4 +5 volts supply input.

5 +2.5 volts, internally stabilized voltage.

6 Electrical control to the varicap diode.
(Connected to Pin 5 when external electrical control not used).

7 0 volts. (The can is also connected to Pin 7).

**Mounting** On bottom face by 4 captive nuts spaced symmetrically 31.75mm (1.25 in) between centres.

Alternative fixing by 2 captive nuts on top face.

The retaining screws are metric M3 length 6mm.

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RACAL

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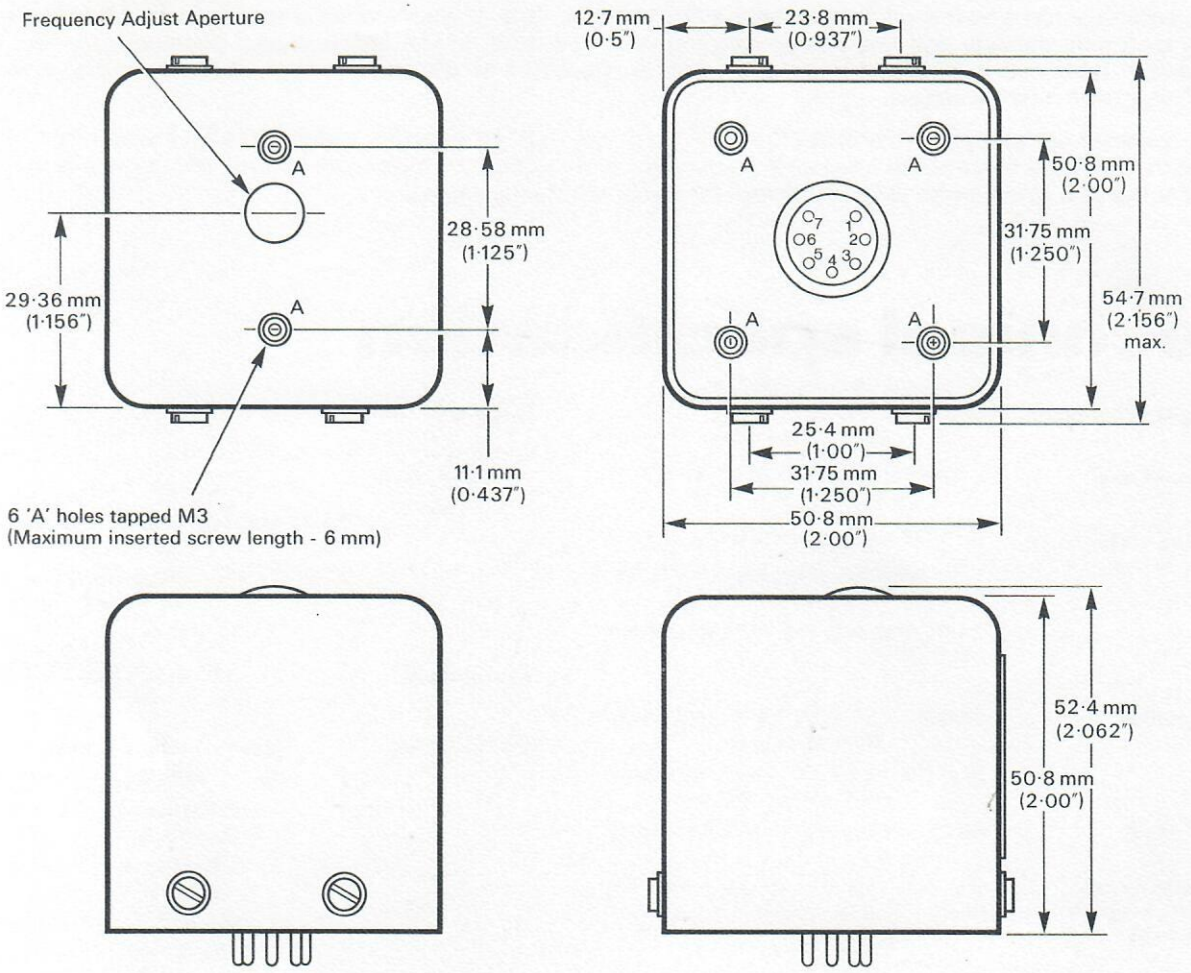
# Product Information




# 9442 Crystal Oscillator

*Racal crystal controlled frequency standards combine low power consumption, good temperature stabilization and excellent ageing performance, and are ideal for use in communications equipment and precision instruments. They are built to stringent military specifications and use only the highest quality glass or coldweld sealed crystals from carefully evaluated suppliers. Great care is taken in production including checking and recording of the temperature and ageing performance of every individual oscillator. Small size, robust construction and fast warm-up characteristics make these oscillators particularly suitable for transportable equipment where high accuracy is required as soon as possible after switch on.*

This oscillator has a warm-up time of only a few minutes. It is of small physical size and combines high accuracy with long term stability and low power consumption. The fundamental 5MHz crystal operates at a low stabilized excitation level and is mounted in an oven with proportional temperature control. A buffer amplifier isolates the oscillator from load variations.

Two versions are available – the 9442/5 which is for use with 5V supplies and the 9442/12 which is a 12V model. In both oscillators mechanical frequency adjustment is provided by a multi-turn control which permits very accurate calibration and gives a trim range sufficient for the life of the oscillator.

# technical specification

**Output Frequency** 5MHz.

**Output Level** 1 volt ±20% peak-to-peak in 1kΩ.

**Ageing Rate** $\pm 1 \times 10^{-8}$ per day at shipment.
$\pm 3 \times 10^{-9}$ per day after 3 months continuous operation.
(rates averaged over minimum period of 10 days)

**Warm-Up**
9442/5: $\pm 1 \times 10^{-7}$ within 6 minutes from switch on.
9442/12: $\pm 1 \times 10^{-7}$ within 4 minutes from switch on.
(at 25°C and nominal supply voltage)

**Stability with Temperature Change** $\pm 3 \times 10^{-9}$ per °C averaged over the range –10°C to +60°C.

**Stability with Supply Voltage Change** $\pm 4 \times 10^{-8}$ for ±10% voltage change.

**Stability with Load Change** $\pm 5 \times 10^{-9}$ for ±10% change of 1kΩ load.

**Trim Range** Approximately –6 to +3 parts in $10^6$ by adjustment of an eight turn variable capacitor accessible via an aperture in top face of oscillator can.

**Supply Voltage**
9442/5: +5 volts ±10%.
9442/12: +12 volts ±10%.

**Supply Current**
9442/5: Initially 550mA for 5 minutes.
Typically 150mA after warm-up.
9442/12: Initially 400mA for 5 minutes.
Typically 60mA after warm-up.

**Dimensions** 51 x 51 x 51mm (2 x 2 x 2in).

**Connections** Made via a B7G base.

| *Pin* | *9442/5* | *9442/12* |
|---|---|---|
| 1 | 5 MHz output relative to 7 | 5 MHz output relative to 7 |
| 2 | Internally connected to 4 | Not used |
| 3 | Not used | Not used |
| 4 | +5 volts supply | +12 volts supply |
| 5 | Not used | Not used |
| 6 | Not used | Not used |
| 7 | 0 volts | 0 volts |
| (Also connected to can) | | (Also connected to can) |

**Mounting** On bottom face by 4 captive nuts spaced symmetrically 31.75mm (1.25in) between centres.
Alternative fixing by 2 captive nuts on top face.
The retaining screws are metric M3 length 6mm.

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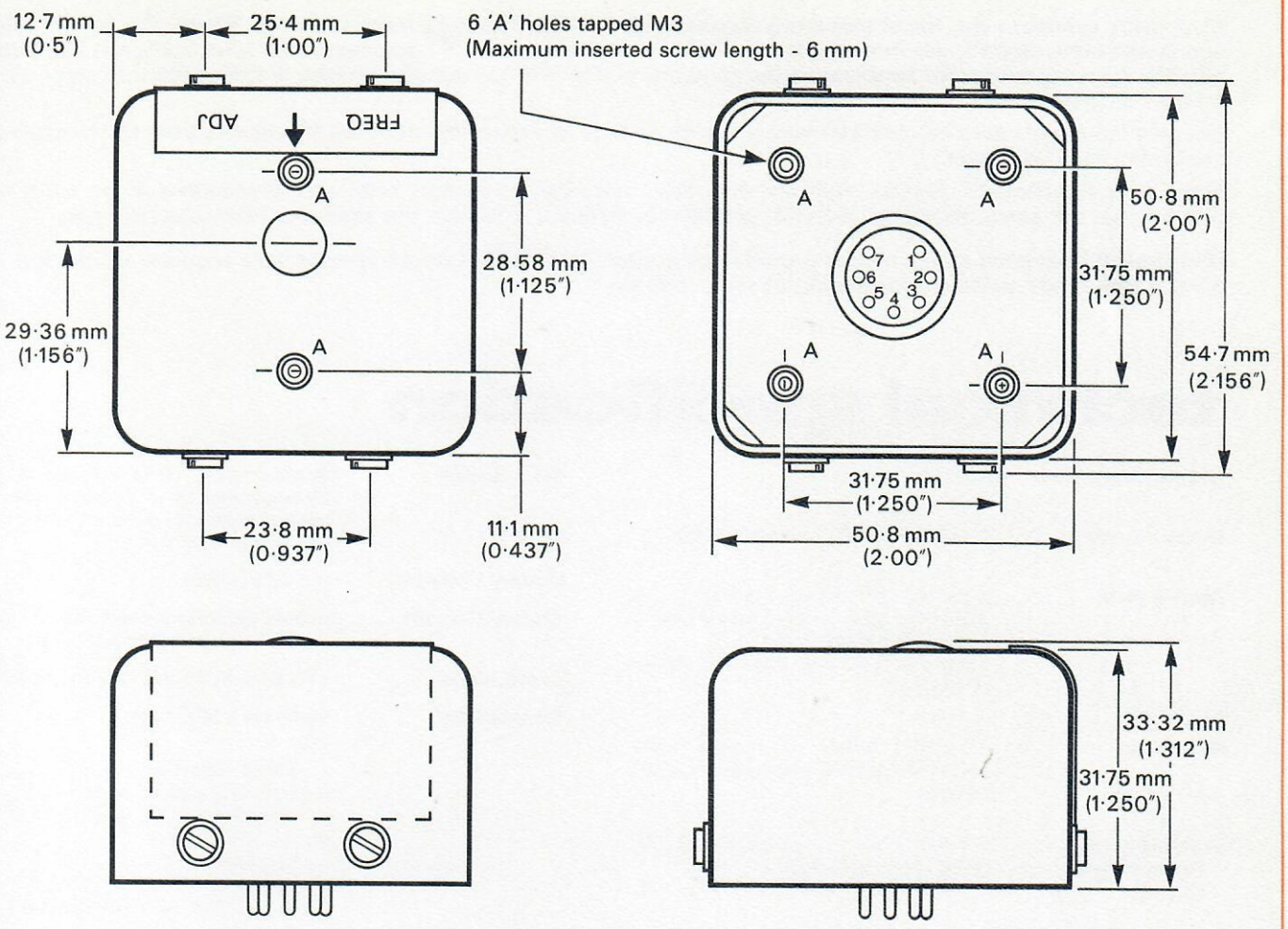
# Product Information




# 9443 Crystal Oscillator

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**Racal-Dana Instruments Limited**

Electrically similar to the Racal frequency standard type 9442, the 9443 measures only 32mm ($1\frac{1}{4}$ in) in height, and is recommended for use where space is limited such as in portable equipment. The specification is identical in all other respects except for temperature performance and power consumption which are dependent to some extent on the can size.

The 9443 is a high stability oscillator with a warm-up time of only a few minutes. It operates from 5V supplies and consumes minimal power.

The 5MHz fundamental crystal operates at a low, stabilized excitation level and is mounted in an oven with proportional temperature control. A buffer amplifier is included to isolate the oscillator from load changes.

Mechanical frequency adjustment is provided by a multi-turn control which permits very accurate calibration and gives a trim range sufficient for the life of the oscillator.

# technical specification

| | |
|---|---|
| **Output Frequency** | 5MHz. |
| **Output Level** | 1 volt ±20% peak-to-peak in 1kΩ. |
| **Ageing Rate** | $\pm 1 \times 10^{-8}$ per day at shipment.<br>$\pm 3 \times 10^{-9}$ per day after 3 months continuous operation.<br>(rates averaged over minimum period of 10 days). |
| **Warm-Up** | $\pm 1 \times 10^{-7}$ within 6 minutes from switch on (at 25°C and nominal supply voltage). |
| **Stability with Temperature Change** | $\pm 4 \times 10^{-9}$ per °C averaged over the range −10°C to +60°C. |
| **Stability with Supply Voltage Change** | $\pm 4 \times 10^{-8}$ for ±10% voltage change. |
| **Stability with Load Change** | $\pm 5 \times 10^{-9}$ for ±10% change of 1kΩ load. |
| **Trim Range** | Approximately −6 to +3 parts in $10^6$ by adjustment of an eight turn variable capacitor accessible via an aperture in top face of oscillator can. |
| **Supply Voltage** | +5 volts ±10%. |
| **Supply Current** | Initially 550mA for 5 minutes.<br>Typically 170mA after warm-up. |
| **Dimensions** | 51 x 51 x 31.75 mm (2 x 2 x $1\frac{1}{4}$ in). |
| **Connections** | Made via a B7G base.<br>*Pin*<br>1 5MHz output relative to 7.<br>2 Internally connected to 4.<br>3 Not used.<br>4 +5 volts supply.<br>5 Not used.<br>6 Not used.<br>7 0 volts (also connected to can). |
| **Mounting** | On bottom face by 4 captive nuts spaced symmetrically 31.75mm (1.25 in) between centres. Alternative fixing by 2 captive nuts on top face. The retaining screws are metric M3 length 6mm. |

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